MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

DME5126 – ENGINEERING MECHANICS II: DYNAMICS

(DME)

13 JULY 2023

2.30 p.m – 4.30 p.m

(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 4 pages including the cover page with 4 Questions only.

2. Attempt ALL questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

(a) Starting from rest, a particle moving in a straight line has an acceleration of $a = 4t - 3\ m/s^2$, where "t" is in seconds. Determine

i) particle's velocity when $t = 6\ s$.

[5 marks]

ii) particle's position when $t = 11\ s$.

[5 marks]

(b) A particle is moving along a straight line such that its position is defined by $s = (20t^2 + 10)$, where "t" is in seconds. Determine

i) Displacement of the particle during the time interval from $t = 1\ s$ to $t = 10\ s$.

[5 marks]

ii) Average velocity of the particle during this time interval.

[5 marks]

iii) Acceleration when $t = 1\ s$.

[5 marks]

Question 2

(a) A 50-kg crate starts from rest and achieves a velocity of $v = 4\ m/s$, when it travels a distance of 5 m to the right by applying a force, P. The coefficient of kinetic friction between the crate and the ground is $\mu_k = 0.3$.

i) Find the acceleration of the crate.

[5 marks]

ii) Draw the free body diagram and mark all the forces acting on the crate.

[5 marks]

iii) Determine the magnitude of force, P acting on the crate.

[5 marks]

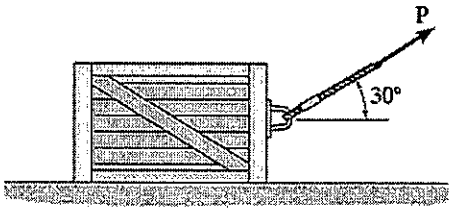

Figure Q2 (a)

Continued ...

(b) The 75-*kg* man pushes on the 150-*kg* crate with a horizontal force, *F*. If the coefficients of static and kinetic friction between the crate and the surface are $\mu_s = 0.3$ and $\mu_k = 0.2$, and the coefficient of static friction between the man's shoes and the surface is $\mu_s = 0.8$, show that the man is able to move the crate. What is the greatest acceleration the man can give the crate?

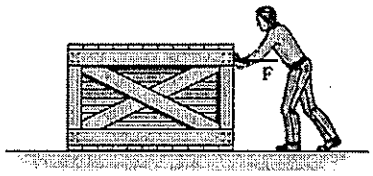

Figure Q2 (b)

[10 marks]

Question 3

The 20-*kg* crate is subjected to a force having a constant direction and a magnitude *F*=100 *N*. When $s = 15$ *m*, the crate is moving to the right with a speed of 8 *m/s*. Determine its speed when $s = 25$ *m*. The coefficient of kinetic friction between the crate and the ground is $\mu_k = 0.25$.

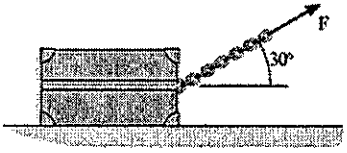

Figure Q3

[25 marks]

Question 4

(a) The pendulum consists of 2-*kg* slender rod and a 4-*kg* circular plate. Determine the radius of gyration of the pendulum about an axis perpendicular to the page and passing through point *O*.

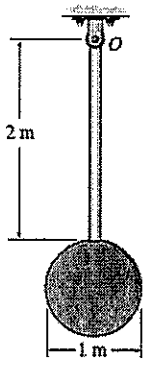

Figure Q4 (a)

[15 marks]

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(b) The assembly is made of the slender rods that have a mass per unit length of 3 *kg/m*. Determine the mass moment of inertia of the assembly about an axis perpendicular to the page and passing through point *O*.

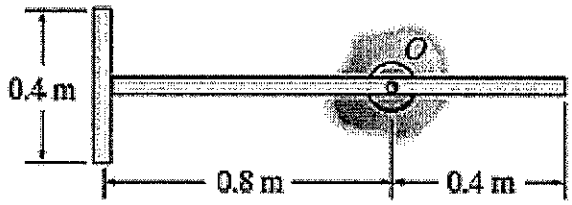

Figure Q4 (b)

[10 marks]

End of paper